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PHYSICS.—*Criteria for gray radiation.* PAUL D. FOOTE, Bureau of Standards.

If certain materials, such as glowing carbon, are maintained at a constant temperature and the brightness of these materials compared spectrophotometrically with that of a black body at various temperatures, it is well known that the logarithm of the ratio of intensities for any wave length is a linear function of the reciprocal of the absolute temperature of the black body and that frequently the straight lines corresponding to various wave lengths intersect in a single point. The writer and Mr. Fairchild[1] have pointed out that this condition of the intersection of the so-called logarithmic isochromatics is no criterion for grayness of the non-black body. Dr. Hyde[2] has also established this point.

Dr. Nutting[3] in a recent paper concludes that the log isochromatics for a black body can not intersect in the manner described, except over a limited range of wave lengths and that the condition of approximate intersection and the condition for grayness may both be satisfied, but either may hold without the other

We disagree with both of these conclusions as applied to our work and desire to point out that the trouble is due partly to a

[1] FOOTE and FAIRCHILD. J. Wash. Acad., **6**: 194. 1916.
[2] HYDE. Ann. d. Phys., (4) **49**: 144. 1916.
[3] NUTTING. J. Wash. Acad., **6**: 476. 1916.

confusion of terminology. Lummer and Pringsheim,[4] Benedict,[5] and Foote and Fairchild[6] have been considering always the ratio of intensities at two temperatures, while Dr. Nutting uses the intensity at a single temperature. It is unfortunate that the term "log isochromatics" has been applied to both types of curves for fifteen years. If one carries through Dr. Nutting's derivation upon the same basis as that used by the other writers,

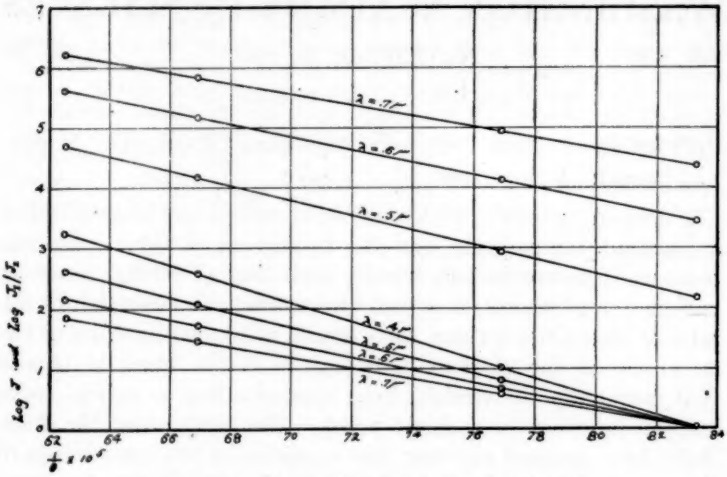

Fig. 1. Plot of log isochromatics for a black body

it is clear that the log isochromatics for black bodies and for a black body compared with a gray body always satisfy the "stigmatic condition" over the entire range of wave lengths from $\lambda = 0$ to $\lambda = \infty$. Furthermore, the condition of grayness of one or both of the radiators necessitates the intersection of the log isochromatics. On the contrary the intersection of the log isochromatics does not prove that the material compared is gray. All of these points were brought out in the earlier paper referred to.[7]

[4] LUMMER and PRINGSHEIM. Verh. d. D. Phys. Ges., **3**: 36. 1901.
[5] BENEDICT. Ann. d. Phys., **47**: 641. 1915.
[6] FOOTE and FAIRCHILD. Loc. cit.
[7] FOOTE and FAIRCHILD. Loc. cit.

As a concrete example we have plotted in figure 1 data for a black body at absolute temperatures 1200°, 1300°, 1500°, and 1600°. The upper four straight lines represent Dr. Nutting's method of plotting. The lower four straight lines represent the method originally suggested by Lummer. The lower four lines converge at $\vartheta = 1200°$ absolute, while, as Dr. Nutting concludes, the upper four do not converge. It may be pointed out that no one ever contended they did converge to a common point. Indeed the points of intersection are given in table 1.

TABLE 1

TEMPERATURES AT WHICH INTERSECTIONS OCCUR ON THE BASIS OF DR. NUTTING'S METHOD OF PLOTTING

λ	0.5 μ	0.6 μ	0.7 μ
μ	*degrees*	*degrees*	*degrees*
0.4	9525	5874	5491
0.5		5238	4869
0.6			4428

When the data for equilibrium radiation are properly plotted there is no "approximation" to the "stigmatic condition." It is a definite intersection as clearly shown in the earlier paper referred to.

In conclusion it is desirable to point out the following facts: (1) A gray body is by definition one for which at a true temperature ϑ the ratio of the intensity of its emission to that of a black body at temperature ϑ, at any given monochromatic wave length, is independent of the wave length chosen. (2) There are two types of log isochromatic curves, one referring to ratio of intensities, the other to the actual values of intensity. The former type of curve is the one of interest in the present discussion. (3) The intersection of log isochromatics for the radiation from a non-black body spectrophotometrically compared with that from a black body is not a criterion for grayness of the non-black body. (4) The temperature at which intersection occurs is not the true temperature of the non-black body,

unless the radiation is gray, but is the so-called "color temperature." (5) In the case of intercomparison of black or gray bodies perfect intersections of the log isochromatics occur for all wave lengths, and the temperature at which the intersection occurs is the true temperature of one of the radiators in question. (6) It is theoretically possible to have two radiators at different temperatures, one gray and the other far from gray, with each showing identically the same spectral distribution of energy.

GEOLOGY. *Clay derived from volcanic dust in the Pierre in South Dakota.* EDGAR T. WHERRY, Bureau of Chemistry.[1]

At several places near the southwestern corner of the state of South Dakota there is found, interbedded in the Pierre formation, a peculiar clay. During the early part of May, 1917, the writer made a field examination of the occurrence of this material, and as a result of his observations, combined with microscopic and chemical examination of the samples collected, has come to the conclusion that this clay represents an altered volcanic dust, accumulated in the sea during Pierre time.

Occurrence. The clay occurs at a number of places along a line, convex toward the south and over 50 miles long, extending from Buffalo Gap to Provo, around the southern end of the Black Hills. It forms numerous beds varying from a fraction of an inch to 4 feet in thickness, interbedded with and sharply delimited from the black shale characteristic of the Pierre; the latter here contains fish bones and the shells of various lamellibranchs and cephalopods, such as Inoceramus and Baculites, clearly fixing its horizon.[2] The majority of the clay beds can be traced practically continuously and without marked variation in thickness throughout the whole of this distance; a very few of them are lenslike and more limited in extent. Near Pedro,

[1] This paper was prepared while the writer was connected with the National Museum.

[2] Specimens of these have been kindly examined and identified as Pierre types by Messrs. J. W. Gidley, of the National Museum, and T. W. Stanton, of the Geological Survey.

50 miles further northwest, a thick bed of similar clay (there called bentonite) occurs at approximately the same geological horizon, but the details of the section are so different that the equivalence of the two deposits can not be regarded as established. These stratigraphic relations are shown in the columnar sections in figure 1.

The continuity of practically every bed of clay and the comparatively slight variation in thickness shown by them throughout the entire distance represented, over 50 miles, are well brought out by these sections. The most remarkable instance of this continuity is in one of the ½-inch clay beds that lies about 5 feet above the main (3 to 4-foot) bed; it can be recognized in every exposure.

Character. The clay forms dense, compact masses, breaking with a conchoidal fracture. When fresh it is deep gray, but on weathering it becomes yellowish, owing to oxidation of the iron compounds present. The weathered outcrops are strewn with innumerable gypsum crystals, resulting from the action of sulfuric acid (arising from oxidation of pyrite, which is abundant in the shale and in places occurs in the clay itself) on calcite, which is distributed through both rocks.

On treatment with water the clay swells up conspicuously, absorbing somewhat more than its own weight of water and becoming sticky or plastic; on adding an excess of water it slumps down to a flocculent slime. This swelling is evidently due to the absorption of water by porous, spongelike, clay particles.

Under the microscope the clay shows an extremely fine grain. When immersed in oil the individual particles, in so far as they can be made out, exhibit slight, variable, but almost universal double refraction, brought out more especially by the insertion of a sensitive-tint selenite plate. Immersion in water, on the other hand, causes a marked diminution in the double refraction, many grains becoming quite isotropic. The index of refraction of the clay, determined by the immersion method, is about 1.50; but it varies, of course, with the water content, and, because of the porous character of the particles, tends to increase slightly

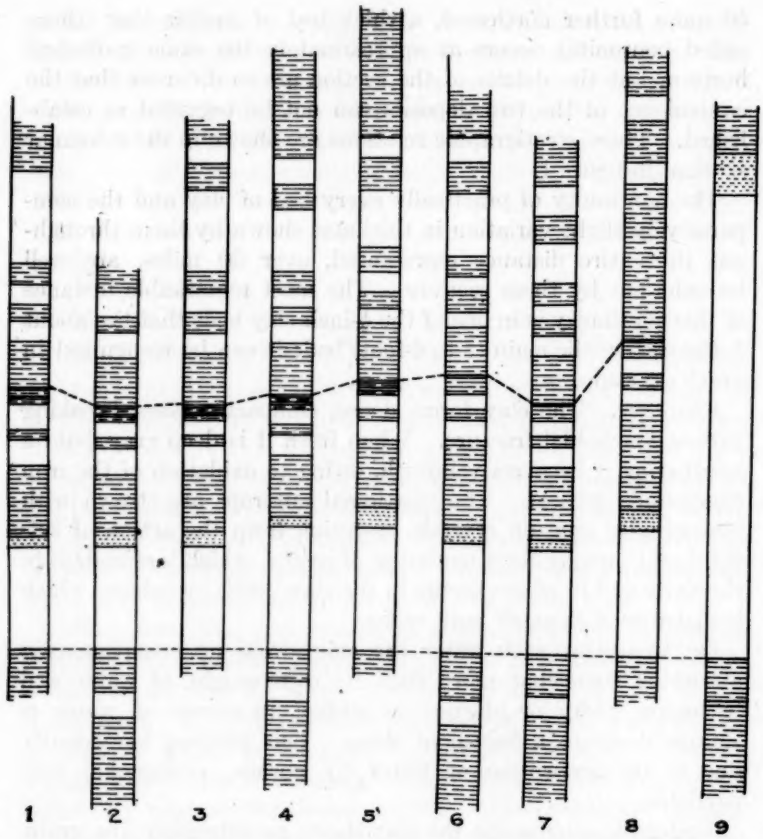

Fig. 1. White areas represent clay, horizontal-lined ones shale, and dotted ones alternations of clay and shale, Scale, ¼ inch = 1 foot. The bottom of the main clay bed is assumed to be at the same horizon in all sections; the 1-inch clay bed lying about 5 feet above the top of the main bed is connected by broken lines.

1. Pit on "Hat No. 1 Lode," 3 miles south of Buffalo Gap, South Dakota.
2. Hill slopes on "Hat No. 2 Lode," ¼ mile south of No. 1.
3. Hill slopes on "Hat No. 5 Lode," 1 mile south of No. 2.
4. Cliff at assessment tunnel, ¾ mile south of No. 3.
5. Hill slopes ½ mile southwest of No. 4.
6. Hill slopes along Hat Creek, 1 mile west of Ardmore, South Dakota, about 40 miles southwest of No. 5.

7. Hill slopes one mile northeast of Ardmore, 2 miles from No. 6.
8. Hill slopes 1½ miles southeast of Provo, South Dakota, about 10 miles northwest of No. 6.
9. Ledges ½ mile southeast of Pedro, Wyoming, about 50 miles northwest of No. 8.

on their standing several hours in contact with the immersion oils.

By virtue of its porosity the clay is able also to adsorb dyes, especially methylene blue. A moderately strong aqueous solution of this substance is completely decolorized on filtering it through a thin layer of the clay, which becomes deep blue. This behavior, in connection with the absorption of water and accompanying swelling, points clearly to its amorphous, colloidal nature. The faint, variable, double refraction which it exhibits when examined in oils does not oppose this view, not being necessarily indicative of crystallinity.[3] There is every reason to believe, on the contrary, that it is connected with strain in the amorphous, colloidal mass, incident to partial loss of water. The practical disappearance of the double refraction when water is added is the result of the relief of this strain, the normal, amorphous condition being thereupon restored.

Average samples contain, in addition to the clay particles, a very few grains of feldspar, biotite, and magnetite. Samples collected from different parts of the main bed (or, for that matter, from any of the beds) show, however, a marked downward increase in the amount of such minerals. When a lump of the clay from the lowermost 2 inches of this bed is stirred up in water several times and the cloudy liquid poured off from the solid matter, a very noticeable residue remains. This is found on microscopic examination to contain the following minerals, all in practically fresh, unaltered condition: plagioclase feldspar —mostly andesine, mica—mostly biotite, magnetite, and calcite (the last representing a precipitate from the sea water).

[3] That optical anomalies, and especially double refraction in normally isotropic minerals, can be produced by strain is well known; and since the preparation of this paper, this point has been emphasised by A. F. Rogers (Journ. Geol., 35: 519. 1917).

No quartz has thus far been detected in any sample from the region. Some clumps of clay are not flocculated, but remain behind with the sandy residue. These probably represent incompletely disintegrated grains of the original material from the

TABLE 1

ANALYSIS OF CLAY

	1	2	3	
SiO_2	51.1	64.0	62.3	63.9
TiO_2			1.6	
Al_2O_3	15.4	19.4	16.1	
Fe_2O_3	4.5	5.6	3.6	6.0
FeO			2.2	
MnO			0.2	
MgO	3.8	4.8	2.0	
CaO	5.2	4.3	4.1	
Na_2O	1.5	1.9	3.6	6.0
K_2O			2.4	
H_2O-	13.1			
H_2O+	4.0		1.5	
CO_2	[1.4]			
P_2O_5			0.4	
Total	100.0	100.0	100.0	

1. Analysis of fresh clay from bottom of main bed, 8 miles south of Buffalo Gap, South Dakota; partial analyses of other samples show variations of 1 or 2 per cent in the several constituents, but not enough to affect materially the conclusions here drawn.

2. Same, recalculated to 100 per cent after deducting H_2O and CO_2 and the amount of CaO corresponding to the latter.

3. Composition of average mica-andesite, after Osann, in Daly, *Igneous rocks and their origin*, New York, p. 26, 1914.

decomposition of which the clay has been derived. While no complete, conclusive proof as to the nature of this substance is obtainable, the irregular shapes and absence of crystal outline of these masses, together with their isotropic, amorphous character, lead to the inference that they originally consisted of volcanic glass. This, with the minerals above noted, would constitute a mica-andesite rock.

The chemical composition of the clay is given in table 1.

Origin. Any theory as to the origin of this clay deposit must account for the peculiar features above noted,—the remarkable continuity of beds for many miles along the strike, the absence of quartz, the presence of fresh feldspar and mica, and the porous, colloidal character of the clay itself. It is believed that these facts are adequately explained by the volcanic dust theory, as here outlined.

That there was considerable volcanic activity in the northern Rocky Mountain region during late Cretaceous and Tertiary times has long been recognized; and that volcanic dust ("ash") was often carried far east over the Great Plains is well known. The Tertiary dusts have been observed throughout Nebraska and as far east as Plattsmouth, Iowa;[4] and in an informal communication before the Geological Society of Washington, Dr. T. W. Stanton has described an occurrence of volcanic dust in the Cretaceous (Fox Hills) in southern North Dakota.[5] But eruptions yielding volcanic dust also occurred still earlier in the Cretaceous, notably in Benton time, as recently emphasized by Hewett.[6] On the occasion of the writer's visit to South Dakota Prof. Freeman Ward, of the University of South Dakota, pointed out a thin stratum of whitish material, which probably represents such an occurrence, in the Benton group as exposed in the Missouri River bluffs in the northeast corner of Nebraska, opposite Vermilion, South Dakota. There is thus no reason to question the possibility that dust-producing eruptions occurred during Pierre time and that this dust was transported as far as what is now southwestern South Dakota.

When volcanic dust falls on dry land it is likely to collect on the lee side of elevations, the deposits being relatively thick in proportion to their lateral extent and showing little or no stratification. Numerous minute laminations may result, on the other hand, from its deposition in shallow lakes.[7] But when blown out over a body of deep water, such as the interior sea that occupied what is now the central part of the North Ameri-

[4] BARBOUR, E. H. *Nebraska pumicite.* Nebraska Geol. Survey, **4**: 361. 1916.
[5] Journ. Wash. Acad. Sci., **7**: 80. 1917.
[6] Ibid., **7**: 196. 1917.
[7] BARBOUR. Loc. cit.

can continent during much of Cretaceous time, the dust would naturally become spread more or less evenly and widely over the bottom. In settling it would, furthermore, undergo at least partial sorting into heavier and lighter, or coarser and finer, particles, and develop some degree of stratification. Grains of feldspar, quartz, hornblende, mica, and other crystalline minerals would settle more rapidly than those of volcanic glass, full of gas-bubble cavities. The lower part of any stratum would thus naturally contain the bulk of the crystalline minerals present in the dust, the upper part most of the glass.

The crystalline minerals, not having been long exposed to atmospheric weathering before deposition, should appear in the sediment in essentially fresh condition. The volcanic glass, on the other hand, being porous and charged with gases,—including, no doubt, hydrochloric acid, sulfur dioxide, and other chemically active gases from the volcanic emanations,—would be likely to undergo "auto-metamorphism," in the sense in which this term has recently been used by H. C. Sargent.[8] The product would naturally be expected to have peculiar properties. When it is considered that rain water containing traces of carbon dioxide, acting on crystalline feldspars at the earth's surface, often produces amorphous halloysite ("kaolinite"), the probability of the development of an amorphous, colloidal clay-material from the originally amorphous volcanic glass in this case is evident. In the former instance most of the alkalies and alkaline earths and part of the silica are dissolved and carried away by the rain water; in the latter, water circulation and diffusion would necessarily be so hampered that little removal of constituents could be expected, except perhaps the most soluble ones, the alkalies. The clay should therefore differ from the original glass chiefly by the presence of more water, and less alkalies. How this is borne out by the composition actually observed is shown in the analyses given in table 1.

The clay here described is hardly to be regarded as a definite mineral. It more probably consists of mixed gels of alumina and silica, with adsorbed alkalies and water. Resemblances in

[8] Paper given before the Geological Society of London; abstract in Nature, 99: 59. 1917.

composition between it and halloysite[9] or leverrierite[10] might be traced, but these resemblances are purely accidental. In basic plagioclase feldspars, and, correspondingly, in andesite glass, the ratio Al_2O_3 : SiO_2 does not greatly exceed 1 : 2, and this ratio is preserved in the clay. The same ratio happens to hold in the two minerals mentioned, but there the resemblance ceases. Mere numerical similarity does not imply relationship in such cases, where one substance is a mixture of gels and the others definite (even though somewhat variable) minerals.

The theory above outlined accounts for the peculiar features of this occurrence in an entirely satisfactory manner. It appears, further, that no other mode of formation would explain many of these features. For instance, all clay brought down by rivers and deposited in the sea contains a large amount of fine quartz grains and rarely any feldspar; but the absence of quartz and the presence of feldspar are two of the most characteristic features of this deposit. The sediments brought into the sea by rivers, moreover, tend to be deposited in lenses or wedges, and their beds rarely extend continuously for more than a few hundreds or thousands of feet. As opposed to this relation, we find here beds, from 1 inch to 4 feet thick, extending for a distance of at least 50 miles, without marked variation in their thicknesses. Finally, the clayey matter in normal sediments has been for so considerable a period exposed to such varied chemical agents—rain water containing carbon dioxide, river water containing small amounts of salts, and sea water containing larger amounts of these,—that, although it may remain amorphous, it has attained a certain degree of stability and definiteness of composition and, since it is no longer particularly porous, after drying out it does not in general take up water again with marked swelling; while the clay here described is highly porous and exhibits the latter property prominently.

The theory of volcanic-dust origin therefore appears to be the only one that satisfactorily accounts for the features shown by this remarkable deposit.

[9] Halloysite being apparently a stable, definite mineral, corresponding to amorphous kaolinite, as shown by E. S. Larsen and the writer (Journ. Wash. Acad. Sci., 7: 178. 1917.) and by A. F. Rogers (Op. cit. 535).

[10] Larsen, E. S., and Wherry, E. T. Journ. Wash. Acad. Sci., 7: 216. 1917.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. Each of the scientific bureaus in Washington has a representative authorized to forward such material to this JOURNAL and abstracts of official publications should be transmitted through the representative of the bureau in which they originate. The abstracts should conform in length and general style to those appearing in this issue.

GEODESY.—*Triangulation in Georgia.* C. H. SWICK. U. S. Coast and Geodetic Survey Special Publication No. 43. Pp. 53, with 9 illustrations. 1917.

This is one of a series of volumes published by the U. S. Coast and Geodetic Survey which give the data for triangulation stations established by that bureau. The present volume contains the geographic positions of approximately 590 triangulation stations in the state of Georgia, in the interior and on the coast. It is expected that the descriptions of these stations in Georgia will be published by the Coast and Geodetic Survey in the near future in a second volume.

In the published form the results of triangulation of the country are made accessible to geographers, surveyors, and engineers for control of maps, surveys, and engineering works of various kinds. The results of this triangulation are also of value to geodesists in the determination of the figure of the earth and in investigations in the subject of isostasy.

C. H. S.

ELECTRICITY.—*Some electrical properties of silver sulphide.* GEORGE W. VINAL. Bureau of Standard Scientific Paper No. 310 (Bull. Bur. Stds. **14**: 331–339). 1917.

Silver sulphide may be prepared in the form of short wires or thin strips like a metal. The wire, which must be drawn hot, was found to conduct electricity like a metal of high specific resistance and approximately zero temperature coefficient. A strip of sulphide rolled at room temperature has a large temperature coefficient and shows both metallic and electrolytic conduction. It has a volt-ampere

curve characteristic of a pyroelectric conductor. The strips are sensitive to small alternating currents, which increase the resistance enormously, while small direct currents have the opposite effect. The specific resistance has been measured and experiments made on the electrochemical decomposition. G. W. V.

OPTICS.—*An investigation of the axial aberrations of lenses.* E. D. TILLYER and H. I. SCHULTZ. Bureau of Standards Scientific Paper No. 311 (Bull. Bur. Stds. **14**: 341–369). 1917.

The errors which affect the definition of a lens are discussed, and methods of graphically representing the central errors described. The condition for freedom from coma near the axis is arrived at. The relative importance of the errors in different types of lenses is discussed. Hartman's method is extended, permitting one set of measurements to give all the important central errors—spherical aberration, zonal variation of equivalent focal length, and axial and oblique achromatism. The apparatus and procedure are described, and the accuracy of the adjustments and of the measurements discussed. The method is applicable to all systems of relatively short focus and large aperture, such as photographic lenses, projection lenses, and telescope objectives, and also to complete optical systems. The results of the method as applied to a complete telescope are discussed, and shown to be independent of the accommodation of the observer. Seventeen sets of curves are given for as many different lenses, and an illustrative discussion of one set of curves, together with a general description of the types of lenses represented by each group of curves is included. E. D. T.

SPECTROSCOPY.—*Wave-length measurements in spectra from 5900 Å to 9600 Å.* W. F. MEGGERS. Bureau of Standards Scientific Paper No. 309 (Bull. Bur. Stds. **14**: 317–329). 1917.

Plates stained in a mixture of dicyanin, water, alcohol, and ammonia were used to photograph the arc spectra of twenty of the chemical elements, including the alkali metals, the alkaline earths, and elements commonly found in iron as impurities; a concave grating of 640 cm. radius, mounted in parallel light was used. This spectrograph gives a dispersion of about 10Å per millimeter in the first order. Exposures of thirty minutes sufficed to record waves longer than 9000 Å. In this paper the wave-lengths in International Angstroms are given for the arc spectra of the following elements: lithium, sodium, potassium, rubidium, caesium, copper, calcium, strontium, barium, and magnesium.

Frequency differences of doublets in the spectra of sodium, potassium, rubidium, caesium, and copper are shown to be constant in most cases to one part in 100,000 in the number of waves per centimeter.

W. F. M.

GEOLOGY.—*Chemical relations of the oil-field waters in San Joaquin Valley, California.* G. SHERBURNE ROGERS. U. S. Geological Survey Bulletin 653. Pp. 119. 1917.

The chief conclusions concerning the chemistry of the waters, deduced from a study of several hundred analyses of water from different depths, are as follows:

1. Oil-field water is not necessarily salty, as is generally believed, and may not be even slightly salty to the taste. The degree of concentration of chloride in such water is governed primarily by local conditions and is not affected by the position of the water in relation to oil.

2. Sulphate, which predominates in most of the shallow ground waters on the west side of San Joaquin Valley, diminishes in amount as the oil zone is approached and finally disappears.

3. The concentration of carbonate increases as the oil zone is approached but depends largely on the concentration of chloride.

4. The horizon, with respect to the oil zone, at which these alterations take place, is different in each field.

On the basis of these conclusions, which appear to be well grounded, at least for the area studied, the following practical suggestions may be made:

In drilling a well in untested territory it may be possible to obtain an indication of the presence or absence of oil and gas below by ascertaining by analysis whether the sulphate is diminishing and the carbonate increasing in the waters successively encountered. In some areas a significant change may be detected as much as 1,000 feet above the oil; in others the upper limit of alteration may be within a few hundred feet of the oil.

The source of the water in a well that produces a mixture of water and oil may be determined, at least in a general way, by studying its chemical composition. In the Westside Coalinga field, for example, the source of the water may thus be determined rather definitely; in the Midway-Sunset field, where the distinctions are less sharp, the success of this method will depend largely on the number of authentic analyses that are available for comparison.

G. S. R.

GEOLOGY.—*Manganese deposits of the Caddo Gap and De Queen quadrangles, Arkansas.* HUGH D. MISER. U. S. Geological Survey Bulletin 660-C. Pp. 64. 1917.

The manganese deposits of the Caddo Gap and De Queen quadrangles in west-central Arkansas comprise those that are at present being most extensively exploited. They have been worked on a small scale only and have yielded but a few hundred tons of marketed ore. They occur in the Arkansas novaculite of Devonian age and are mainly confined to two stratigraphic horizons, one being near the top and the other near the middle of the formation. The novaculite, together with the other formations, has been closely folded and its outcropping edges stand up as parallel, nearly eastward-trending ridges on which rock ledges or their dèbris abound. The manganese ores consist of oxides,—psilomelane, pyrolusite, and manganite being most abundant. Although these minerals may be found separately, as a rule two or more are intimately mixed in the same deposit, and in some places they are associated with iron oxides and manganiferous iron ores. The manganese ores occur as nodules, pockets, and short irregular veins from a fraction of an inch to 4 feet thick. Thicknesses of 4 feet, however, are rare, and those of a foot are not common. The ores occupy bedding planes or joint cracks or form a cement in novaculite breccia.

Most of the manganese was probably deposited originally as finely disseminated particles with the silica that formed the novaculite, a rock that is regarded as belonging to the class of charts; the rest of the manganese may have been deposited in disseminated form in the overlying and underlying shales. Its concentration has been effected by ground water, which has carried it down from the vast mass of rock that has been eroded from the region; and its localized concentration into deposits large enough to be of value appears to have been dependent upon the amount of open space in the novaculite, which is hard and compact and usually has no visible openings between the layers or along the joints. Faults and the ends of plunging anticlines, as is attested by a number of deposits occurring in such places, were favorable places for the accumulation of ore.

Most of the ores contain too much phosphorus for the manufacture of ferromanganese. They usually contain too much iron for use in chemical industries and electric batteries, and, where the quality is suitable for these purposes, the quantity is generally too small for profitable mining. The quantity of ore that can be mined at a profit from any one deposit is small. H. D. M.

ORNITHOLOGY.—*Notes on the fringilline genus Passerherbulus and its nearest allies.* HARRY C. OBERHOLSER. Ohio Journ. Sci. **17**: 332–336. June 2, 1917.

A careful examination and comparison of the species of *Passerherbulus* at once discloses the fact that this genus as at present constituted is a composite group. It is, therefore, here separated into four genera. The seaside sparrows, six in number, are given the name *Thryospiza* gen. nov., with *Fringilla maritima* Wilson as the type. For *Passerherbulus caudacutus* and its two subspecies the generic name *Ammospiza* Oberholser is used. The Nelson sparrow (*Ammodramus caudacutus nelsoni* Allen) and the Acadian sharp-tailed sparrow (*Ammodramus caudacutus subvirgatus* Dwight) prove now by examination of more material to be both subspecies of *Ammospiza caudacuta* (Gmelin). The genus *Passerherbulus* is here restricted to *Passerherbulus leconteii* (Audubon); and for *Emberiza henslowii* Audubon and its western subspecies the new genus *Nemospiza* is proposed. H. C. O.

ORNITHOLOGY.—*The status of Aphelocoma cyanotis and its allies.* HARRY C. OBERHOLSER. The Condor **19**: 94–95. May, 1917.

The blue-eared jay, *Aphelocoma cyanotis* Ridgway, was originally described from Mexico and has since been reported from Texas. The Texas birds, however, prove to belong to *Aphelocoma texana;* and *Aphelocoma cyanotis* is therefore restricted to Mexico. Although heretofore regarded as distinct species, *Aphelocoma cyanotis, Aphelocoma texana, Aphelocoma sumichrasti,* and *Aphelocoma woodhouseii* are all now discovered to be geographic races of *Aphelocoma californica.* Incidentally the bird described by Dr. Joseph Grinnell as *Aphelocoma californica immanis* from southern Oregon is reinstated. H. C. O.

ORNITHOLOGY.—*The birds of Culebra Island, Porto Rico.* ALEXANDER WETMORE. The Auk **24**: 51–62. January, 1917.

This is the first published list of the birds of the Island of Culebra, and is based largely on observations made and the specimens collected by the author from April 4 to 22, 1912. The number of species here recorded from the island is 54, including one of doubtful status, a good proportion of which are considered resident species. None are, however, peculiar to Culebra Island. Notes on habits are added under many of the species. H. C. O.

ORNITHOLOGY.—*Description of a new genus of Anatidae.* HARRY C. OBERHOLSER. Proc. Biol. Soc. Washington **30**: 119–120. May 23, 1917.

The rare Laysan teal, *Anas laysanensis* of authors, interesting on account of its limited island distribution, is found to differ decidedly in structural characters from any genus of ducks hitherto recognized, and is here made the type of a new genus, *Horizonetta*. H. C. O.

ORNITHOLOGY.—*Notes on North American birds. I.* HARRY C. OBERHOLSER. The Auk **34**: 191–196. April, 1917.

This is the first of a series of articles on the status, relationships, and nomenclature of various North American birds. The present installment treats of seven species and subspecies. The specimen of *Cepphus snowi* Stejneger, said to have been taken on the Kenai River, Alaska, proves to be, owing to the possibility of transposition of labels, very doubtfully North American. A specimen of the South American *Dendrocygna viduata* killed in New Jersey, and recorded as an addition to the North American fauna, seems undoubtedly to be a bird that has escaped from captivity, and as such not entitled to a place in our fauna. The status of the forms of *Anas rubripes* is discussed and the conclusion reached that both *Anas rubripes rubripes* and *Anas rubripes tristis* are recognizable subspecies, the former breeding from northern Ungava to Hudson Bay, and the latter from Maryland and Newfoundland west to Wisconsin. The form of California partridge inhabiting Santa Catalina Island, California, originally described as *Lophortyx catalinensis* Grinnell, is reinstated as a subspecies of *Lophortyx californica*. The Florida race of *Myiarchus crinitus* and the American robin breeding on the Pacific Coast from the northwestern United States to southern Alaska are both considered tenable subspecies and revived to stand as *Myiarchus crinitus residuus* Howe and *Planesticus migratorius caurinus* Grinnell, respectively. H. C. O.

ORNITHOLOGY.—*Description of a new Sialia from Mexico.* HARRY C. OBERHOLSER. Proc. Biol. Soc. Washington **30**: 27–28. February 21, 1917.

A new and unexpected form of the eastern bluebird is here described as *Sialia sialis episcopus*, from specimens taken at Santa Engracia, Tamaulipas, northeastern Mexico. It presents a combination of the characters of *Sialia sialis sialis* and *Sialia sialis fulva*. It proves to be also the breeding bluebird of the lower Rio Grande region in Texas. H. C. O.

ORNITHOLOGY.—*Critical notes on the eastern subspecies of Sitta carolinensis Latham.* HARRY C. OBERHOLSER. The Auk **24**: 181–187. April, 1917.

Although the white-breasted nuthatch of the eastern United States has been recently divided into three forms, careful investigation now shows that only two, a northern and southern, are recognizable. The race from Florida, hitherto called *Sitta carolinensis atkinsi*, must now be known as *Sitta carolinensis carolinensis* Linnaeus, since birds from the type locality of the latter, South Carolina, are referable to the Florida form. The recently described *Sitta atkinsi litorea* of Maynard, from the coast region of southern North Carolina, consequently becomes a synonym. True *Sitta carolinensis carolinensis* therefore ranges from Florida and Louisiana north to southern North Carolina and southern Illinois. The bird of the northeastern United States, from northern Illinois and northern North Carolina northward into southern Canada, heretofore called *Sitta carolinensis carolinensis*, becomes therefore nameless and is here christened *Sitta carolinensis cookei*. H. C. O.

ORNITHOLOGY.—*A synopsis of the races of Bombycilla garrula (Linnaeus).* HARRY C. OBERHOLSER. The Auk **24**: 330–333. July, 1917.

The Bohemian waxwing, which occurs in northern North America, northern Asia, and northern Europe, although heretofore supposed to be undifferentiated into geographic races, is found to be made up of three recognizable subspecies. These are *Bombycilla garrula garrula* (Linnaeus), from Europe; *Bombycilla garrula centralasiae* Poljakov, from central and northern Asia; and *Bombycilla garrula pallidiceps* Reichenow, from North America. The North American representative proves to be a well-marked form. H. C. O.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

BOTANICAL SOCIETY OF WASHINGTON

The 122d regular meeting of the Botanical Society of Washington was held at the Cosmos Club, Tuesday, October 2, 1917, at 8 p.m. Thirty-one members were present. The following scientific program was given:

Need for textile plant fibers (Illustrated with lantern slides): LYSTER H. DEWEY. The speaker presented for the inspection of the audience samples of the fiber produced from different plants, such as flax, hemp, jute, and henequén, and showed slides illustrating the culture of these crops and the operations necessary for separating the fiber therefrom. The following conclusions were announced by the speaker: The reduced production of flax and hemp in Russia, and jute in India, combined with difficulties of transportation and increased consumption of certain fibers, has resulted in demands greatly in excess of supplies.

Flax is not now regarded as absolutely necessary for tablecloths and napkins, and it has long since given place to cotton in most of the so-called linen collars and shirts, but it is demanded in the wings of airplanes, and must be used largely in shoe thread. Ireland's 107,000 acres of flax, double the area devoted to this crop in pre-war years, and the marked increase up to 39,000 acres in Japan are helping out the supplies, while hemp and cotton are used more than ever before as substitutes.

Hemp is in demand as indicated by the increase in the price from about 6 cents per pound before the war to 16 cents per pound now. The usual supplies of Russian hemp and Italian hemp have been cut down, while the prices for these imported hemps have gone up 300 per cent. Hemp is used for commercial twines, fishing lines, nets, packing, and oakum, and it is now being dressed like flax and made into shoe thread. The reduced supply of imported hemp is more than counterbalanced by the increased supply of hemp grown in this country, the acreage increasing from 4000 in 1914 to more than 41,000 in 1917.

Jute is normally used in greater quantity than any other fiber except cotton, and in addition to its use for covering cotton, wool, grain, sugar, coffee, cement, and many other articles in transit it is now in demand for sand bags in the trenches. Practically all of the jute of the world's supply comes from India. The crops of the last two years have been below the normal consumption, and this, added to the very serious difficulties of transportation, has resulted in shortage of supply and

advanced prices. The most promising substitute for jute is low-grade hemp and flax.

More publicity has been given to the shortage of henequén (Yucatan sisal) for binder twine than to most other fibers. Reports from Yucatan, where most of this fiber is produced, and also from other regions where sisal, Manila maguey, and other substitutes suitable for binder twine are produced, indicate that with reasonable economy there will be twine enough for the grain crop next season. The present high prices are inducing the establishment of sisal and henequén plantations in many parts of the Tropics, but it will take five years or more for most of these plantations to reach the stage of production. Until that stage is reached hemp grown in the United States offers the most promising solution of the binder-twine problem. Fibers from various kinds of yuccas, dasylirions, and sansevierias have been suggested, but, besides being poorly adapted for the purpose, no satisfactory method has been developed for preparing them, and with present demands on all well-equipped machine shops this is no time for the development of experimental machinery.

This shortage of supplies of fiber has one bright side. It has persuaded American spinners to appreciate the possibilities of American-grown fiber as they have never done before.

The 17th annual business meeting of the Society was held in connection with the 122d regular meeting as announced above. The report of the Executive Committee showed the following facts concerning the activities of the Society for the preceding year: Average attendance, forty-nine members and fourteen guests. Fifteen new members were elected, making a total membership of one hundred and sixty-three. The customary reports were presented and approved, and the following officers elected for the ensuing year: *President*, WALTER T. SWINGLE; *Vice President*, J. W. T. DUVEL; *Recording Secretary*, CHAS. E. CHAMBLISS; *Corresponding Secretary*, H. N. VINALL; *Treasurer*, F. D. FARRELL. The retiring president, T. H. KEARNEY, was nominated as the representative of the Society upon the Board of the Washington Academy of Sciences.

H. N. VINALL, *Corresponding Secretary.*

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

The 792d meeting was held at the Cosmos Club, October 13, 1917. Vice President HUMPHREYS in the chair, 127 persons present.

By invitation Mr. R. A. MILLIKAN delivered a paper on *The organization of scientific effort in relation to the war.*

Mr. G. K. BURGESS gave a paper on *The application of science to warfare in France.*

Discussion: The papers were discussed by Messrs. LITTLEHALES, L. J. BRIGGS, and KILLIAN.

DONALD H. SWEET, *Secretary.*